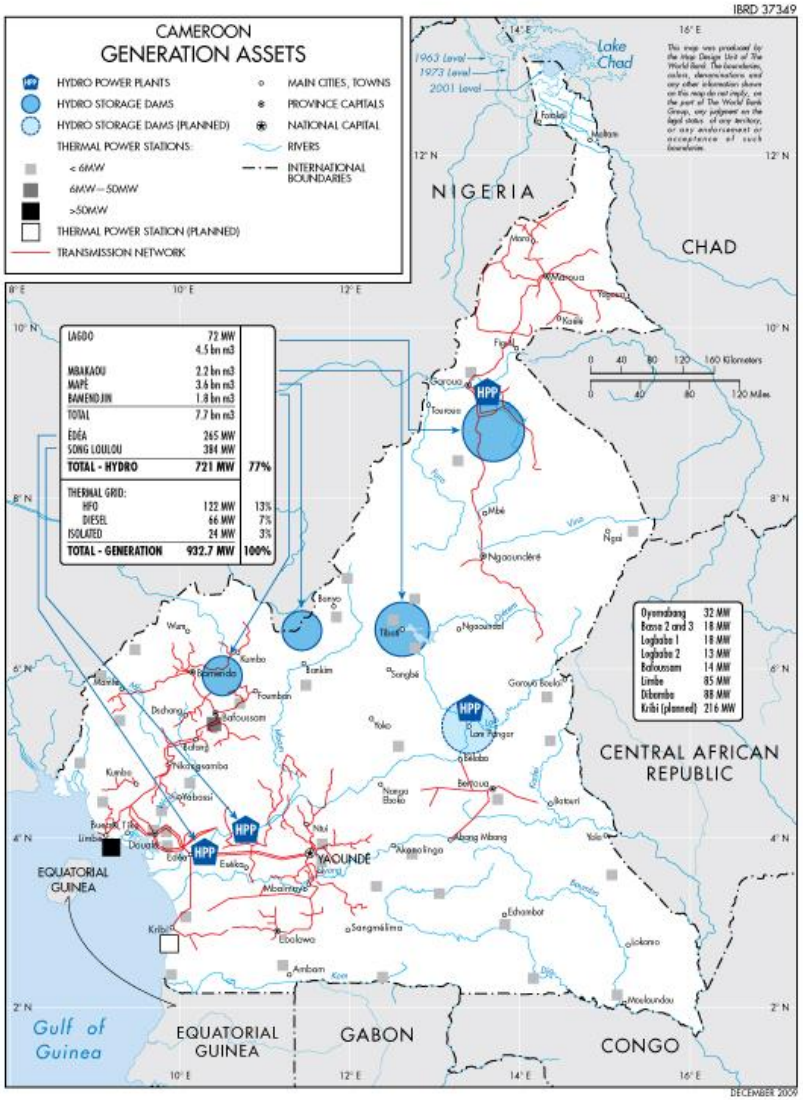
# Harnessing Central Africa's Hydropower Potential

Yves Andre Prevost
Lead Environment Specialist
World Bank
Washington, DC

# Agenda

- Overview of Cameroon's power sector
- Opportunities in hydropower in Cameroon
- Central African Power Pool
- Climate change
- Safeguard issues
- Some lessons for sustainable hydropower development

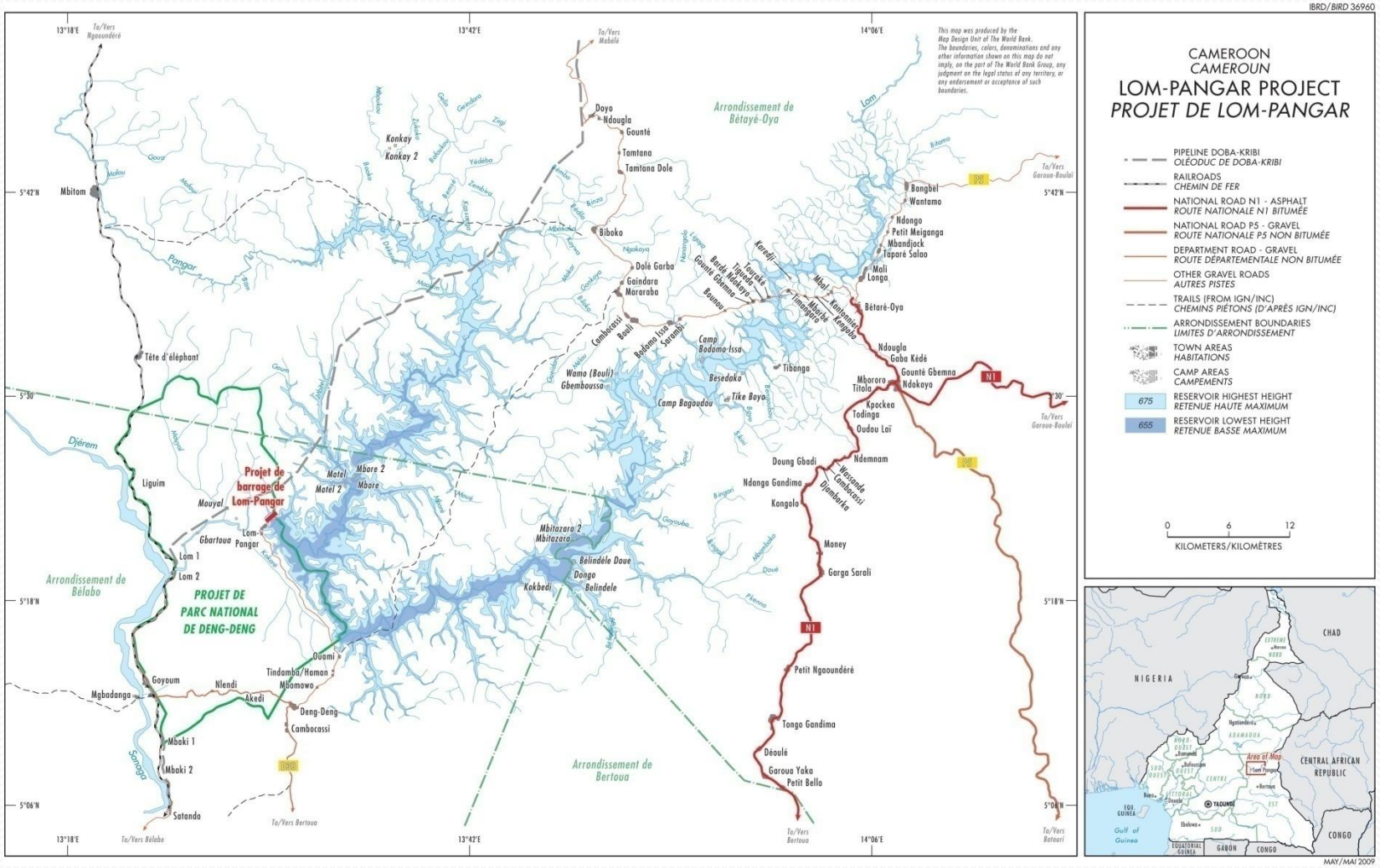
# Overview of Cameroon's power sector



# Overview of Cameroon's power sector

- Above average electricity access rate (48%) – but low in rural areas (14%)
- Estimated 12,000 MW of hydropower potential – but only 721 MW developed (Edea, Song Loulou, Lagdo)
- Remainder of installed network capacity (298 MW) is expensive thermal capacity
- Additional 31% expensive autoproduction
- High power costs are a key impediment to competitiveness, growth and poverty reduction
  - ⇒ Lack of reliable electricity estimated to cost 5% in lost enterprise revenues and 2% in lost GDP growth p.a.
  - ⇒ GOC's *Vision 2035 and Strategy for Growth and Employment 2010-2019* focuses on development of Cameroon's hydropower potential

# The Lom Pangar Hydropower Project

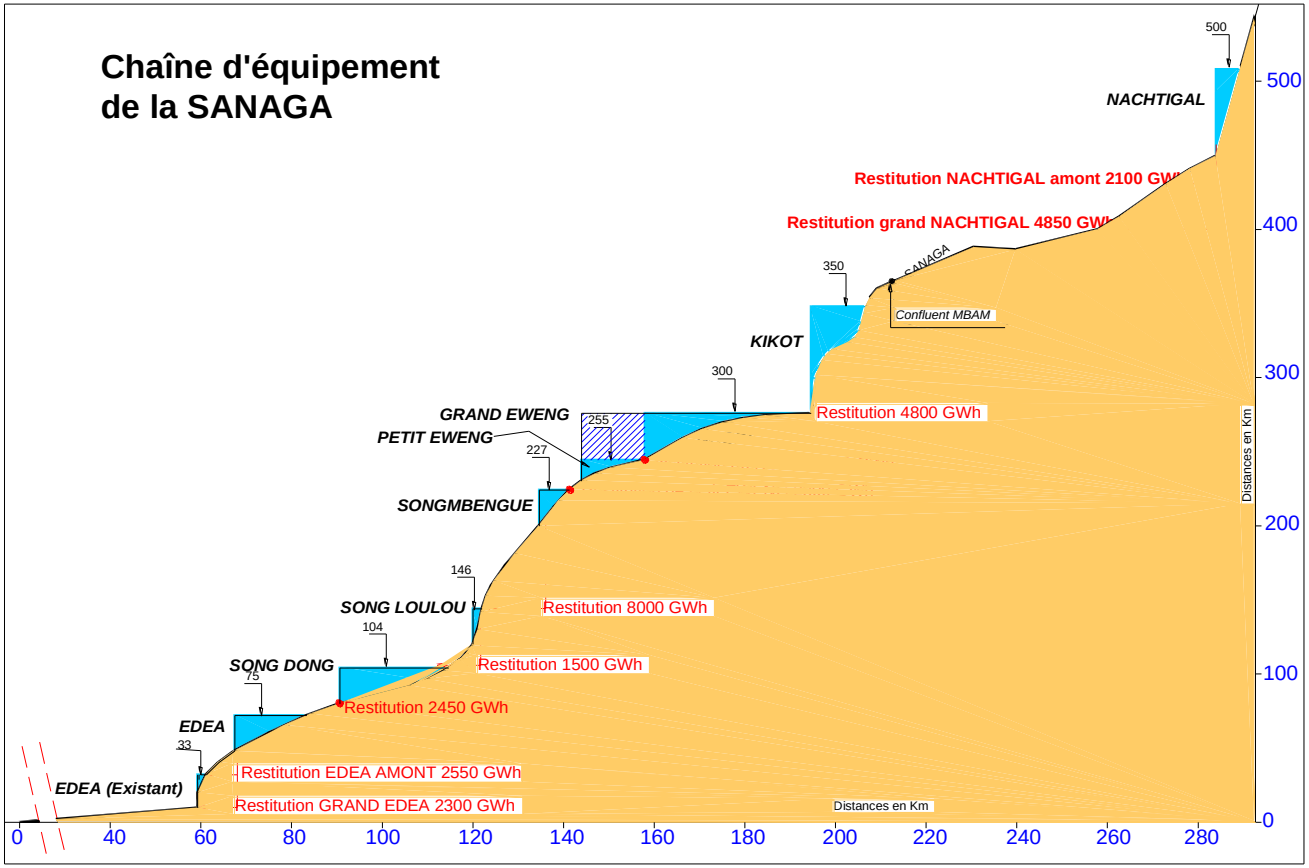


# Lom Pangar Hydropower Project

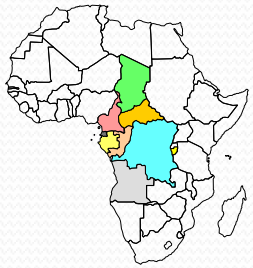
- Regulating dam with a reservoir of 6 bn $m^3$ useful capacity, power house and transmission line, requiring investments in associated access infrastructure and adaptation of 25 km of Chad-Cameroon pipeline
- Priority project in GOC's *Vision 2035* and *Strategy for Growth and Employment 2010-2019*
- Total project cost: $430 m
- Developer: EDC
- Key project benefits
  - 130 MW increased capacity at two existing hydropower plants on the Sanaga River (Edea, Song Loulou)
  - 30 MW for rural electrification of Eastern Region
  - Unlocking access to 6,000 MW of hydraulic potential on the Sanaga River through improved river regulation
  - Potential to reduce marginal power costs over time to as low as $0.02/kWh (after construction of Nachtigall) compared to $0.09/kWh of alternative gas power

    *=> Significant contribution to improving competitiveness and growth and reducing poverty*

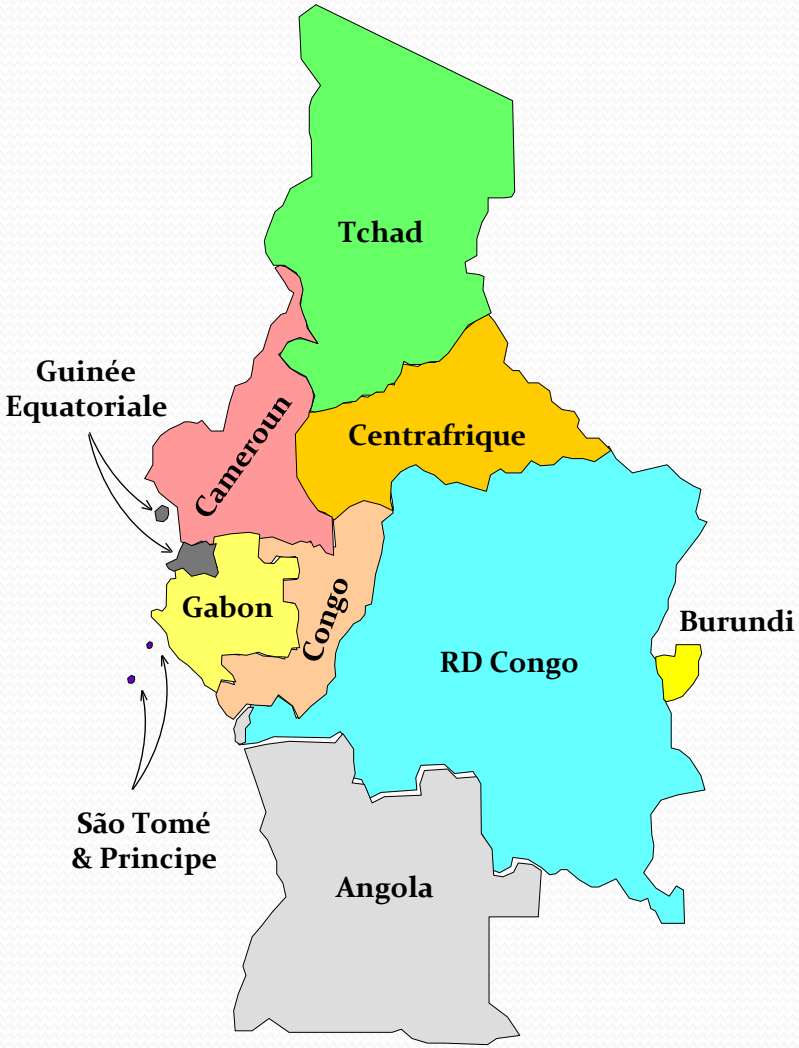
# Future hydropower development opportunities on the Sanaga river



# Central African Power Pool (CAPP)



- 10 member states
- Size : 6 640 359 km$^2$
- Population:  120 million
- Regional electricity access rate:  13%



# CAPP – Significant opportunities for cost reduction

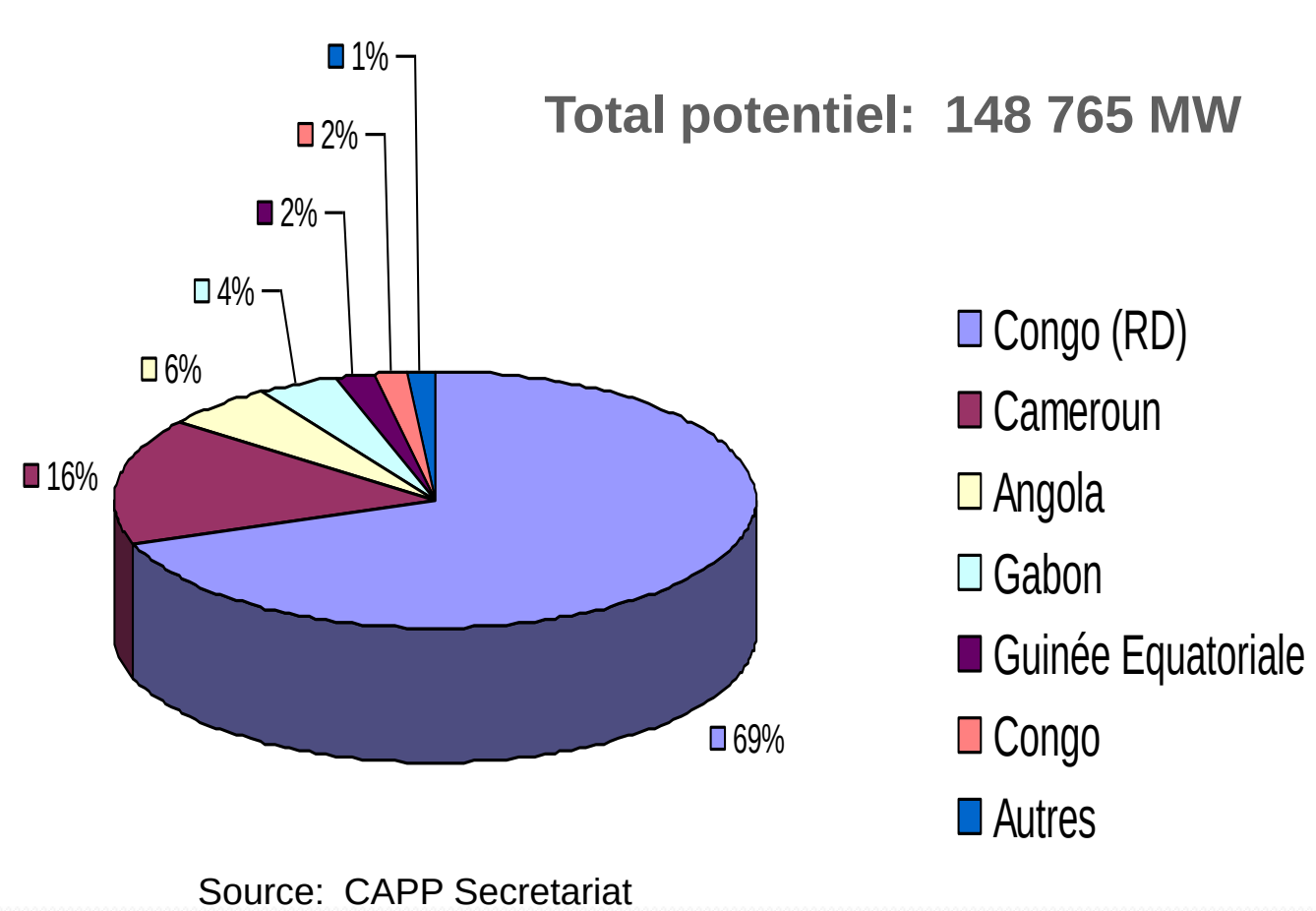
**Affordability of monthly bill at cost recovery prices:**
**US$ per month, consumption 50 kWh/month**

| | Historic costs | Long Run Marginal Costs | |
|---|---|---|---|
| | | Trade expansion | Trade stagnation |
| CAPP | 24.3 | 3.5 | 4.5 |
| EAPP | 9.5 | 7.0 | 6.5 |
| SAPP | 7.0 | 3.0 | 3.5 |
| WAPP | 10.7 | 9.0 | 9.5 |

Source: Africa Infrastructure Country Diagnostic

**Green – affordable to all but poorest 25%**
**Red – unaffordable**
**Yellow – affordable to existing customers only**

# CAPP – Hydropower potential by country

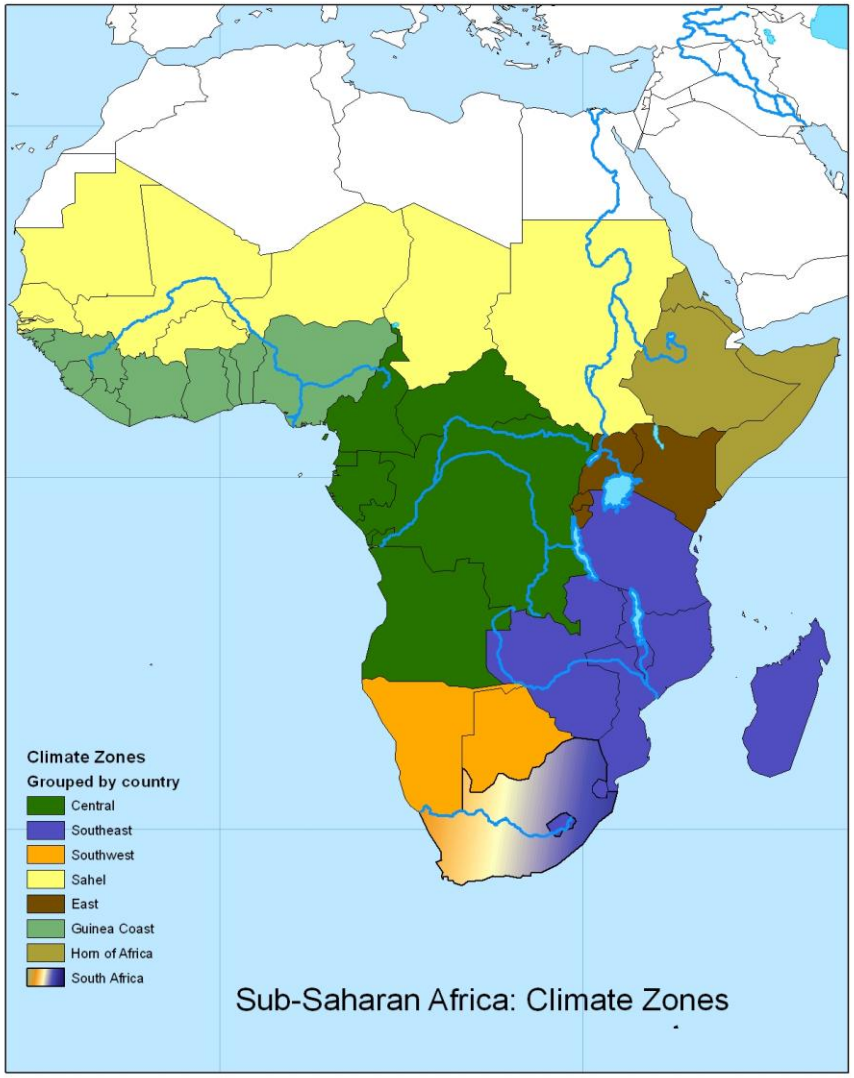



Source: CAPP Secretariat

# CAPP: How to make it work

- Develop a regional least cost masterplan to determine regional priority investments
- Conduct detailed feasibility studies (technical, economic and financial feasibility studies, environmental and social impact analyses etc.)
- Put in place the market rules
  - Market code: Under development (USAID financing)
  - Interconnected grid operating rules: Being developed (EU financing)
  - Regulator: Being studied (EU financing)
  - Tariff system: To be developed
- Complete interconnection protocols between member governments
- Complete regional transmission network – currently only three interconnections (DRC – Congo; DRC – Burundi – Rwanda; DRC – Zambia) plus 6 cross-border connections, mostly from DRC
- Build institutional capacity
- Attract public and private financing for priority investments

# Climate change:  mild impact on Central Africa



# Climate change:  mild impact on Central Africa

- **West Africa**
  - **Sahel:** Further drying possible, large uncertainties, shortening of growing period
  - **Guinea Coast:** Sea Level Rise, decrease in precipitation (some areas)
- **Horn of Africa:** Heat waves, small precipitation gains largely offset by high temperatures, shortening of growing period
- **East Africa:** Increase in Precipitation (strongest model agreement!), More intense rainfall events (flood risk!), drought risk continues
- **Central Africa:**  No change or more wet, more intense rainfall event
- **Southern Africa:**
  - Drying trend over large parts of region, flood and drought risk
  - E/Central S. Africa: Cyclones intensify (most at risk: Mozambique, Madagascar)
- **Sea Level Rise**
  - Most exposed: Densely populated Guinea Coast and low lying islands
  - Key Countries: Gambia, Guinea-Bissau, Senegal, Ghana, Liberia, Sierra Leone, Nigeria, Benin, Togo, Cote d'Ivoire, Cameroon

## COUNTRY EXPOSURE TO CHANGE IN CLIMATE

| | Floods (Wetter) (Higher Runoff) | Droughts (Dryer) (Lower Runoff) | Sea Level Rise | Cyclone |
|---|---|---|---|---|
| High | Niger | Gambia | Gambia | Mozambique |
| | Mali | Mauritania | Guinea-Bissau | Madagascar |
| | Chad | Guinea | Senegal | Mauritius* |
| | Kenya | Sudan (Eastern) | Ghana | Comoros* |
| | Eritrea | Botswana (Eastern) | Liberia | |
| | Sudan (Western) | Botswana (Western) | Sierra Leone | |
| | Ethiopia | Namibia | Nigeria | |
| | Angola (Northern) | Lesotho | Benin | |
| | | Angola (Southern) | Togo | |
| | | Zambia | Cote d'Ivoire | |
| | | Zimbabwe | Cameroon | |
| | | | Cape Verde | |
| | | | Sao Tome & Principe | |
| | | | Comoros | |
| | | | Seychelles* | |
| | | | Mauritius* | |
| Moderate | Equatorial Guinea | Guinea-Bissau | Madagascar | Tanzania |
| | Gabon | Senegal | Eritrea | |
| | Congo | South Africa (Western) | Somalia | |
| | Burundi | South Africa (Eastern) | Kenya | |
| | Rwanda | Swaziland | Tanzania | |
| | Uganda | Malawi | | |
| | Tanzania | | | |
| | Mozambique | | | |
| | Malawi | | | |
| Low | Nigeria | | | |
| | Central African Rep | | | |
| | Congo, Dem Rep | | | |

# Opportunities and threats of climate change for hydropower projects in Central Africa

- Increased expected rainfall improves the economic attractiveness of small scale and large scale hydropower projects
- Hydropower offers significant mitigation opportunities to reduce greenhouse gas emissions, for example by
  - Replacing polluting thermal power stations
  - Creating environmental offsets for water reservoirs
- At the same time, the impact of large-scale water reservoirs brings new challenges (methane)
- New financing opportunities in addition to existing government, donor and investor funds (CDM, CTF, et al.)
- Climate risk management needs to be a core component of project development, for example
  - New hydrological models – historical patterns no longer applicable
  - Increased probability of floods – dam safety aspects
  - Capacity building

# Safeguards

***Issues:***

- Consistency with Regional and National Energy, Environment and Water Resources Strategies
- No Action or Without Project Alternative
- Investment Alternatives and Technical Alternative
- Direct and Cumulative Environmental and Social Impacts
- Impacts of Construction Camps, Quarries
- Impacts of Associated Facilities – Access Roads, Transmission Lines
- Environmental Impacts – Construction and Operation
- Impacts – Upstream, Impoundment and Downstream

# Safeguards

***Issues:***

- Water, Ecosystems and Biodiversity – Including to Aquatic Resources and Fisheries
- Land Acquisition and Resettlement – Restoration of Livelihoods
- Indigenous Peoples
- Cultural Heritage
- Induced Development in the Greater Project Area
- Health Impacts – Worker Health and Safety, HIV/AIDs

# Safeguards

***Issues:***

- Meaningful Consultations  with Diverse Stakeholders
- Disclosure of Environmental and Social Assessment Studies, Resettlement Plans and Indigenous Peoples Plans
- Dam Safety, Emergency Management and Community Safety
- Riparian Notification
- Use of Independent Panel of Experts for Dam Safety
- Use of Independent Panel of Experts for Environment and Social

# Hydropower

***Emerging Issue:***

- How to address impacts and risks from Climate Change into Environmental Assessment of Hydropower Projects?

# Lessons for sustainable hydropower development (1)

- **Plan ahead**:
  - Hydropower projects are complex and technical, economic, environmental and social feasibility studies take time;  experience in the region shows that this can take several years
- **Build capacity early:**
  - Most African governments and utilities do not have adequate capacity for the sustainable preparation of complex infrastructure
  - Capacity building of line ministries, project companies and regulating agencies needs to take place before project preparation
  - *Example Cameroon*:  The World Bank's ongoing energy, environment and forestry projects started building capacity of EDC, MINEP, MINFOF, MINEE, MINDAF, ARSEL and civil society before preparation of the complex Lom Pangar investment project
- **Ensure adequate coordination of all stakeholders:**
  - Dam's are everyone's business (local and foreign governments, local and foreign NGOs, bilateral and multilateral donors, local and national population, private sector investors etc.)
  - Coordination and communication failures can create significant technical, social and reputational risks

# Lessons for sustainable hydropower development (2)

- **Be transparent:**
  - Good dams require good governance
  - Tariffs, contractual frameworks and benefit sharing mechanisms need to be well defined to attract investment finance by donors as well as private investors and maximize the impact on growth and poverty reduction
  - Access to private infrastructure finance requires a favorable business climate
  - Role for parliamentarians in holding stakeholders accountable
- **Maximize development linkages:**
  - Hydropower projects bring significant direct and indirect development benefits at the national and local level
  - Increased access to low-cost electricity improves the competitiveness of firms (growth) and increases household income (poverty reduction)
  - Integrated project development in the context of a national, regional and communal development plan is important to maximize development benefits beyond project-level risk mitigation